PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P100523PC00/SJR	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/GB 03/04893	International filing date *(day/month/year)* 11.11.2003	Priority date *(day/month/year)* 11.11.2002
International Patent Classification (IPC) or both national classification and IPC H04L12/56		
Applicant CLEARSPEED TECHNOLOGY PLC et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
22.03.2004	24.02.2005
Name and mailing address of the international preliminary examining authority: European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Gregori, S Telephone No. +31 70 340-4127

Form PCT/IPEA/409 (Cover Sheet) (January 2004)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB 03/04893

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-8 as originally filed

Claims, Numbers

1-47 received on 08.02.2005 with letter of 04.02.2005

Drawings, Sheets

1/2-2/2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	
	No:	Claims	1-47
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-47
Industrial applicability (IA)	Yes:	Claims	1-47
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following document:

D1: US 2002/075882 A1 (DATTA UTPAL ET AL) 20 June 2002 (2002-06-20).

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of independent claims 1, 2 and 24 is not new in the sense of Article 33(2) PCT.

Claim 1
The document D1 discloses (the references in parentheses applying to this document): A system comprising means for sorting incoming data packets in real time; means for assigning an exit order to said packets in real time (see figure 4 the sorter); and queue means for receiving said sorted packets in said exit order before said packets are stored in memory (see figure 4 paragraph [033]).

Claim 2
The document D1 discloses (the references in parentheses applying to this document): A data packet handling system, comprising means whereby incoming data packets are assigned an exit order before being stored in memory (see figure 4 paragraph [033]).

Claim 42
Claim 42 describes a computer system comprising a data handling system as claimed in any of claims 1 to 21, and it is therefore also not new.

Claim 43
Claim 43 describes a network processing system comprising a data handling system as claimed in any of claims 1 to 21, and it is therefore also not new.

Claim 44

Claim 44 describes a computer system adapted to perform the method as claimed in any of claims 22 to 40, and it is therefore also not new.

Claim 45

Claim 45 describes a network processing system adapted to perform the method as claimed in any of claims 22 to 40, and it is therefore also not new.

Claim 47

Claim 44 describes a data carrier containing program means adapted to perform the method as claimed in any of claims 22 to 40, and it is therefore also not new.

Dependent Claims 2-21, 23-41, 46 they are also not new or inventive (Article 33(3) PCT) because their subject-matter has already been disclosed by D1 or it is a normal design procedure for the person skilled in the art.

Claims

1. A system comprising means for sorting incoming data packets in real time before said packets are stored in memory.

2. A data packet handling system, comprising means whereby incoming data packets are assigned an exit order before being stored in memory.

3. A system as claimed in claim 1 or claim 2 wherein the sorting means is responsive to information contained within a packet whereby to determine an exit order number for that packet.

4. A system as claimed in claim 2, wherein the sorting means is responsive to information contained in a table whereby to determine an exit order number for that packet.

5. A system as claimed in claim 2, wherein the sorting means is responsive to information associated with a data packet stream in which said packet is located whereby to determine an exit order number for that packet.

6. A system as claimed in claim 1 or claim 2, comprising queue means to queue sorted packets for output in exit order.

7. A system as claimed in claim 6, wherein said sorting means is adapted to insert sorted packets in said queue means in exit order.

8. A system as claimed in claim 6 or 7, wherein said queue means is a single queue.

9. A system as claimed in claim 8, wherein said single queue provides a plurality of virtual queues.

10. A system as claimed in claim 6, further comprising a queue manager adapted to insert packets into said queue means in exit order.

11. A system as claimed in claim 6, further comprising means to drop certain packets before being output from said queue means.

12. A system as claimed in claim 6, further comprising means to drop certain packets before being queued in said queue means.

13. A system as claimed in any of the preceding claims, wherein:
said sorting means and said queue means process only packet records containing information about said packets, and
data portions of said packets are stored in said memory for output in accordance with an exit order determined for the corresponding packet record.

14. A system as claimed in any of the preceding claims, wherein said sorting means comprises a parallel processor.

15. A system as claimed in claim 14, wherein said parallel processor is an array processor.

16. A system as claimed in claim 14, wherein said array processor is a SIMD processor.

17. A system as claimed in claim 14, 15 or 16, further comprising means to provide access for said parallel processors to shared state.

18. A system as claimed in claim 17, further comprising a state engine to control said access to said shared state.

19. A system as claimed in any of claims 1 to 18, further comprising tables of information for sorting said packets or said packet records, wherein said tables are stored locally to each processor or to each processor element of a parallel processor.

20. A system as claimed in claim 19, wherein said tables are the same on each processor or on each processor element of a parallel processor.

21. A system as claimed in claim 19, wherein said tables are different on different processors or on different processor elements of a parallel processor.

22. A system as claimed in claim 19, wherein said processors or processor elements share information from their respective tables, such that:

(a) the information held in the table for one processor is directly accessible by a different processor or the information held in the table in one processor element is accessible by other processing element(s) of the processor; and

(b) processors have access to tables in other processors or processor elements have access to other processor elements in the processor, whereby processors or processor elements can perform table lookups on behalf of other processor(s) or processor elements of the processor.

23. A system as claimed in any of the preceding claims, wherein said sorting means implement algorithms for packet scheduling in accordance with predetermined criteria, such as WFQ, DFR, congestion avoidance (eg WRED) or other prioritisation and sorting.

24. A method for sorting incoming data packets in real time, comprising sorting the packets into an exit order before storing them in memory.

25. A method as claimed in claim 24, wherein the sorting is responsive to information contained within a packet whereby to assign an exit order number for that packet.

26. A method as claimed in claim 24, wherein the sorting is responsive to information contained in a table whereby to determine an exit order number for that packet.

27. A method as claimed in claim 24, wherein the sorting is responsive to information associated with a data packet stream in which said packet is located whereby to determine an exit order number for that packet.

28. A method as claimed in claim 24, further comprising queuing sorted packets for output in exit order.

29. A method as claimed in claim 28, wherein said packets are inserted into a queue means in exit order determined by the means performing the sorting.

30. A method as claimed in claim 28, comprising inserting sorted packets into a queue means in exit order under control of a queue manager.

31. A method as claimed in claim 29 or 30, wherein said queuing is performed using a single output queue.

32. A method as claimed in claim 31, further comprising providing a plurality of virtual queues by means of said single output queue.

33. A method as claimed in claim 28, further comprising dropping certain packets before being output from said queue means.

34. A method as claimed in claim 28, further comprising dropping certain packets before being queued in said queue means.

35. A method as claimed in any of claims 24-34, wherein:

said sorting and said queuing operations are performed only on packet records containing information about said packets, said method further comprising:

storing data portions of said packets in said memory for output in accordance with an exit order number determined for the corresponding packet record.

36. A method as claimed in any of claims 24-34, wherein said sorting is performed by a parallel processor.

37. A method as claimed in claim 36, wherein said parallel processor is an array processor.

38. A method as claimed in claim 36, wherein said array processor is a SIMD processor.

39. A method as claimed in claim 36, 37 or 38, further comprising providing access for said processors to shared state under control of a state engine.

40. A method as claimed in claim 39, further comprising providing tables of information for sorting said packets or said packet records, wherein said tables are stored locally to each processor or to each processor element of a parallel processor.

41. A method as claimed in claim 40, wherein said tables are the same on each processor or on each processor element of a parallel processor.

42. A method as claimed in claim 40, wherein said tables are different on different processors or on each processor element of a parallel processor.

43. A method as claimed in claim 40, wherein said processors or processor elements share information from their respective tables, such that:

(a) the information held in the table for one processor is made directly accessible by a different processor or the information held in the table of one processor element is made directly accessible to other processor element(s) of the processor; and

(b) access is provided for said processor or processor elements to tables in other processors or processor elements, whereby processors or processor elements can perform table lookups on behalf of another processor or processor element.

44. A system as claimed in any of claims 1-23, wherein said sorting means implement algorithms for packet scheduling in accordance with predetermined criteria, such as WFQ, DFR, congestion avoidance (eg WRED) or other prioritisation and sorting.

45. A computer system, comprising a data handling system as claimed in any of claims 1-23.

46. A network processing system, comprising a data handling system as claimed in any of claims 1-23.

47. A computer system adapted to perform the method as claimed in any of claims 24-43.

48. A network processing system adapted to perform the method as claimed in any of claims 24-43.

49. A computer system as claimed in claim 45 implemented as one or more silicon integrated circuits.

50. A data carrier containing program means adapted to perform the method as claimed in any of claim 24 to 43.